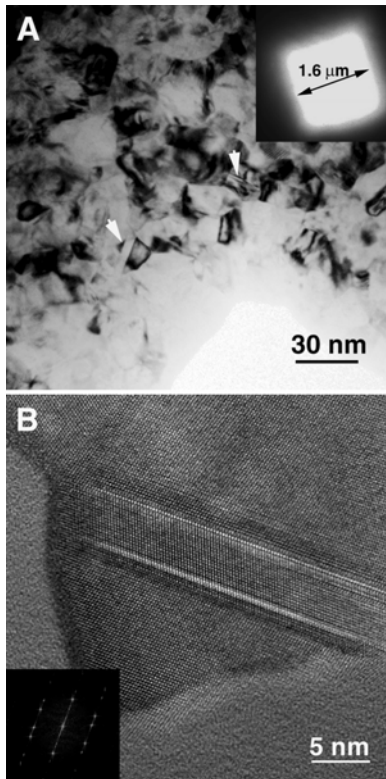


“Uncovering deformation mechanism of nanostructured materials”

**K.J. Hemker (PI), En Ma, J.F. Molinari, Johns Hopkins University,
Grant No. DMR0210215**

Twinning in Nanocrystalline Aluminum



- First experimental observations of deformation twins and stacking faults in 10-20 nm grains of plastically deformed nanocrystalline aluminum. Twins are not observed in coarse-grained pure aluminum and can be directly related to the nanocrystalline structure.
- These TEM observations confirm theoretical (MD) predictions and have implications for interpreting the unusual mechanical behavior of nanocrystalline materials.
- Dislocation-based model developed to explain the transition from normal slip to partial dislocation controlled deformation mechanisms when a grain size decreases to tens of nanometers.

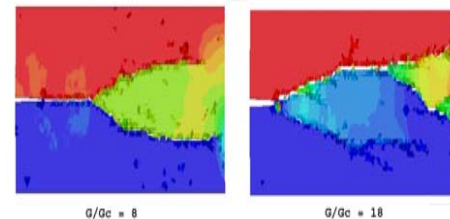
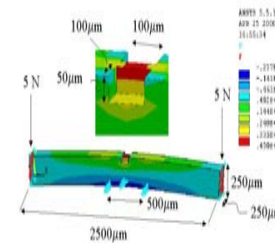
Chen, Ma, Hemker, Sheng, Wang, Cheng “Deformation Twinning in Nanocrystalline Aluminum”, Science, 300 (2003) 1275-1277.



“Uncovering deformation mechanism of nanostructured materials”

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- Research Objectives:
 - One-step processing (vapor deposition) of nanocrystalline films.
 - Microsample tensile testing of nanocrystalline films.
 - *In situ* TEM observations of deformation mechanisms.
 - FE modeling with realistic grain size variations and observed deformation mechanisms.



“Uncovering deformation mechanism of nanostructured materials”

Grant No. DMR0210215

- **Core Faculty:**
K.J. Hemker (PI), J.F. Molinari and En Ma
- **Research Scientist:**
Mingwei Chen (partial support)
- **Post-doctoral Fellow:**
Fred Momprou (6/04)
- **Graduate Students:**
Dan Gianola, Derek Warner
- **Undergraduates:** to be recruited
- **International Collaborators:**
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